Our Ref. No.: 42390P4817

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application for:

Phillip E. Mattison

Application No.: 09/141,210

Filed: August 27, 1998

For: **IMPROVING THE PORTABILITY OF DIGITAL IMAGES**

Examiner: Yosef Kassa

Art Unit: 2621

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

#14
10-18-02

DECLARATION PURSUANT TO 37 C.F.R. §1.131

I, Phillip E. Mattison, hereby declare that:

1. I am a citizen of United States of America.

2. I currently reside at 2401 W. Marlin Drive, Chandler, Arizona 85248.

3. I was an employee of Intel Corporation ("Intel") in Chandler, Arizona from approximately April 1992 until approximately April 2000.

4. My title at Intel was Engineer.

5. I am the sole inventor of the above-identified patent application.

6. Intel is the assignee of the above-identified patent application.

7. I have reviewed U.S. Patent No. 6,260,021 issued to Wong, et al. ("Wong"), which was filed on June 12, 1998. The Examiner has cited Wong against the claims of the above-identified application.

8. The invention disclosed and claimed in the above-identified patent application was conceived in the United States of America prior to June 12, 1998, as

evidenced by the attached Intel Invention Disclosure document (Exhibit A). This document was reduced to writing internally within Intel prior to June 12, 1998. The Intel Invention Disclosure Document demonstrates conception of the invention of the above-identified application and was prepared based on my own original work.

9. Between June 11, 1998 and the filing of the above-captioned patent application on August 27, 1998, I corresponded with Farzad Amini, a patent attorney with the law firm Blakely, Sokoloff, Taylor & Zafman LLP, in a diligent effort to constructively reduce the invention to practice. Attached as Exhibit B are a facsimile cover sheet and a facsimile confirmation showing that Mr. Amini sent me a draft of the above-identified patent application. The draft referred to in Exhibit B was sent prior to June 12, 1998. Attached as Exhibit C is a copy of an e-mail that I sent to Mr. Amini, prior to June 12, 1998, with my comments regarding the draft application referred to in Exhibit B. Attached as Exhibit D are a letter, a facsimile cover sheet, and a facsimile confirmation, all dated July 17, 1998, showing that Mr. Amini sent me a further draft of the above-identified application. Attached as Exhibit E are a letter and a Federal Express Airbill, both dated August 13, 1998, showing that Mr. Amini sent me a revised draft of the above-identified application. Exhibits B through E demonstrate diligence in moving towards constructive reduction to practice from at least June 11, 1998 through August 27, 1998.

10. Therefore, I conceived of the invention disclosed and claimed in the above-identified patent application prior to the filing date of Wong and diligently worked towards constructively reducing the invention to practice from prior to Wong's filing date until the filing date of the above-identified patent application.

11. The Intel Invention Disclosure document provided herewith is designated "Intel Confidential." It is Intel's practice to maintain in secrecy all documents designated "Intel Confidential." I believe that the Intel Invention Disclosure document has at all

times prior to the filing date of the above-captioned application been maintained in a confidential manner.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Respectfully submitted,

Dated: 9/25, 2002

Phillip E. Mattison

Full Name: Phillip E. Mattison
Citizenship: U.S.A.
Residence: 2401 W. Marlin Drive
Chandler, Arizona 85248

6745 CEG(AZ)/DPD

Intel Invention Disclosure, Rev 8,

LEGAL# P#_____
BSTZ# _____ SHSL#_____ DATE: _____

It is important to provide accurate and detailed information on this form (fill in ALL areas under Inventor[]). The information will used to evaluate your invention for possible filing as a patent application. When completed, please return this form to the Legal Department at HF3-03. If you have any questions regarding this form or to whom it should be be forwarded, please call 696-5455.

1. Inventor(s):
Name: **Phillip E. Mattison** ✓ Empl. No. **US059013**
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Group Name: **CEG** Division Name: **DPD** Subgroup Name: **Strategic Marketing**

2. Title of Invention: **Method to Improve Portability of Digital Photographic Images**

3. Stage of development, i.e. % complete, and relation of technology to the following product/process:

This invention is proposed for use in product specifications currently under development in CEG. Negotiations are currently underway with technology partners (Kodak and Hewlett-Packard specifically) to define digital photography interoperability standards, of which this invention is expected to be part. If these efforts are successful the invention will be incorporated into products released in 1998 at the latest.

5. If invention conceived, or constructed during performance of a government or third party contract, please check here and give the contract name and number. N/A

6. Please attach a page to this form, DATED AND SIGNED BY ONE INVENTOR (PREPARER), to provide an abstract of your invention, and include the following information in your abstract:
(a) State general purpose(s) of your invention;
(b) Describe advantage(s) of your invention over what is done now;
(c) Describe essential element(s) or key to your invention; and
(d) Value of your invention to Intel (how will it be used?).

*HAVE YOUR SUPERVISOR READ, DATE AND SIGN COMPLETED FORM

DATE: _____ SUPERVISOR: _____

BY THIS SIGNING, I (SUPERVISOR) ACKNOWLEDGE THAT I HAVE READ AND UNDERSTAND THIS DISCLOSURE, AND RECOMMEND THAT THE HONORARIUM BE PAID.

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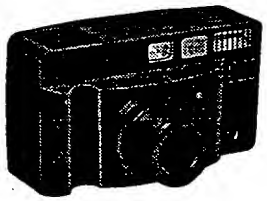


Method to Improve Portability of Digital Photographic Images

Invention Disclosure

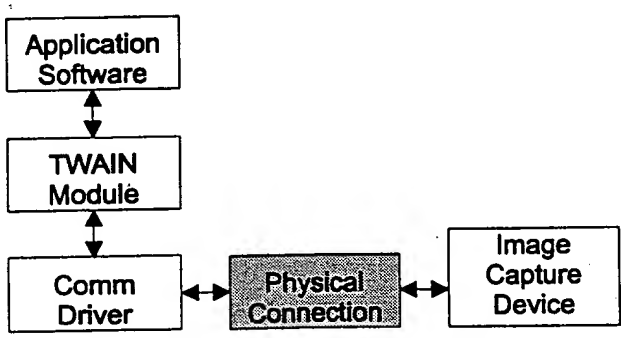
Phil Mattison
554-5730

ABSTRACT

This document describes a method of storing digital photographic images in a way that makes it unnecessary for independent camera manufacturers to agree on specific factors related to the production and processing of images to reach a viewable format. It also makes it unnecessary for host computers used to view or manipulate images to have specific knowledge of the particular camera or image capture device used to produce the image. This allows cameras and other image capture devices to evolve independently of the host machine or operating system. It also eliminates the need for image application developers to recognize and handle the large number of image file formats currently in use, or for image peripheral manufacturers to debate one another over which is the best format for storing images, or what is the best method for processing them

PRIOR ART

Current practice in the digital photography business is for camera manufacturers to develop digital cameras independent of one another. This is not likely to change. Each new camera is typically bundled with a software application designed specifically to work with that camera. As a result there is little or no agreement on how images should be stored, how they should be processed before they are stored, or how a PC should handle images from cameras or other image capture devices (scanners, for example). The nearest thing to a de-facto standard in the market today is the TWAIN driver, which is a software module that provides a standard interface to application programs for retrieving images from an image capture device. Typically the TWAIN module contains software unique to the device it is shipped with, specifically how to control the hardware image peripheral and how to translate from the peripheral-specific image format into some common image format for host use. Software applications designed to work with TWAIN can allow the user to select which device to use (which module to load) if there are multiple devices connected to the host system. If the peripheral is connected to a different host machine it is necessary to load the corresponding TWAIN module as well. Typically the TWAIN module communicates with a standard host operating system interface for physical communication with its corresponding peripheral device. The following simplified block diagram illustrates a typical communication path from a software application to a digital image capture device.



If the image capture device is something like a flatbed scanner this model works reasonably well, and in fact scanners were the principal motivation for developing the TWAIN protocol. The subsequent rise of digital cameras for use with the PC resulted in adoption of TWAIN as the path of least resistance for image transfer in many cases. Images stored in the physical capture device may be in any format, depending on the characteristics of the device. The TWAIN module typically converts from the native format into some common intermediate format for manipulation by the application software, such as a common RGB bit map, or Device Independent Bitmap (DIB) as defined by Microsoft. The application can then store the image on disk in any of dozens of possible file formats. A few examples of the more common ones are BMP, JPEG, GIF, TIFF and

so on. A relatively recent development in this area is the FlashPix format. The advent of removable storage media for digital cameras, however, has created a new problem. Because the removable storage in some cases is portable (flash memory miniature cards, for example) it is not always practical to associate a device-specific software module with it. Because the flash miniature card is a common storage medium, i.e. it is not used exclusively for images but is more like a solid-state floppy disk, using it in a camera does not automatically make it the solid-state equivalent of film. On the other hand, when used in cameras it is desirable that it should have some of the qualities of film, specifically that it should be easy to transport the images it contains to a variety of different destinations, not only to the PC on which the camera's special TWAIN driver is loaded. This is especially true given the fact the camera is not the only way the image data can be extracted from the card, i.e. the card can be inserted into other cameras or into a generic card reader. A typical sequence of image processing is defined in the following table, once for processing in the camera and once for processing in the host. In practice the processing may be completed partially in the camera and partially on the host. As a result the data actually transmitted from the camera to the host may range anywhere from totally raw image sensor data to a finished image file in a popular file format.

Processing in Camera	Processing in Host PC
Image is captured raw from image sensor.	Image is captured raw from image sensor.
Image is processed by internal hardware to finished form.	Image is stored in internal or removable media.
Image is stored in internal or removable media.	Image is transferred to host PC.
Image is transferred to host PC.	Image is processed by TWAIN module to intermediate form.
Image is stored on host PC disk.	Image is processed by PC application software to finished form.
	Image is stored on host PC disk.

The proliferation of PC image file formats alone is confusing, and there is nothing to prevent camera makers from creating yet more new formats to accommodate new developments in camera technology. Continued evolution of camera technology is in fact desirable, so attempts to make a standard of any particular format tends to stifle a desirable phenomenon. A common approach in the past has been to take a commonly used format and continually add variants to support new low-level image encoding methods. This does not solve the portable storage media problem, however, because it still depends on the existence of software that will recognize each new format. Widespread adoption of software to recognize new formats is the fundamental barrier to the realization of a truly ubiquitous image format on any media, portable or otherwise. Portability simply aggravates the problem. Conventional photographs, whether on slides or prints, are inherently portable because they can be directly viewed. The possible exception of slides requiring a slide viewer still doesn't have the same problem because all slide viewers accept the same format. For digital photography the PC is analogous to a slide viewer with added capabilities such as printing, darkroom functions and communications, but there is no equivalent standard format for images.

DESCRIPTION OF THE INVENTION

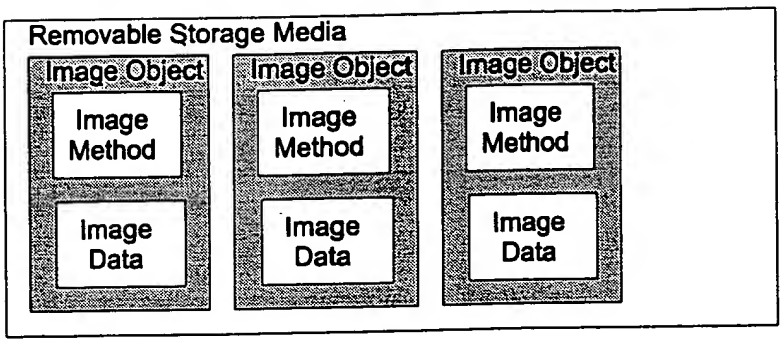
Rather than attempt to force adoption of a particular format for image storage on portable media, the preferred method is to allow unlimited variation in image encoding methods, but include with each image or group of images the intelligence to support the translation of the unique encoding into a common one, such as a DIB. Each image then becomes, rather than an image *file*, an image *object* in the classical sense of object-oriented software. This means the image object contains both image data and instructions for translating that data into a common format. What then becomes common among all image formats is a set of instructions that can be used to define translations specific to native image formats. Each machine must be able to interpret the *instructions*, which

tell it how to interpret the image *data*. The data can therefore be in any form. Because all image processing is inherently mathematical in nature, the instruction set for image objects can be extremely simple. It need consist only of instructions in three categories: Data movement (load, store, move, etc.), Math instructions (add, subtract, multiply, etc.) and Control (jump, branch, loop, etc.) Consistent with object-oriented terminology, the instruction portion on an image object can be called its Method. By executing the image method in a controlled environment where the method has access only to its own raw image data and an output memory buffer, image methods can be prevented from presenting a threat to the host system's security or integrity. The output of an image object's execution is a simple image data file in a common format, such as DIB, which can be subsequently stored or processed in any way desired by application software. Using this technique, the sequence of image processing would be as follows:

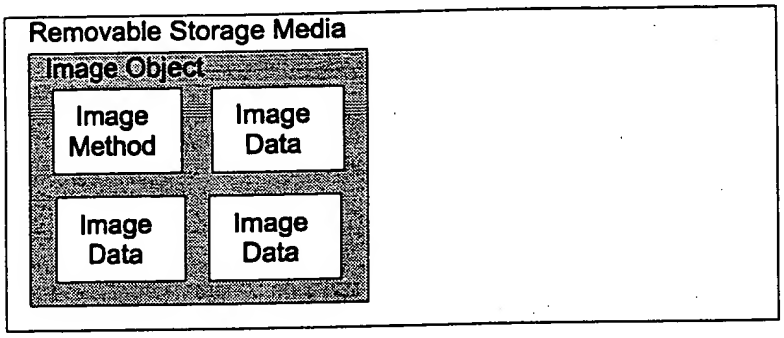
Image is captured raw from image sensor.
Image may or may not be partially processed in the capture device.
Image is stored on internal or removable media along with translation method instructions.
Image object is transferred to host PC.
Host PC executes image method, resulting in common image data format output (DIB?).
Image is processed by PC application software to finished form.
Image is stored on host PC disk.

The difference in this approach is the software that executes image object methods can be developed and distributed independent of image capture devices. As long as image objects conform to the requirements of the image object execution environment they are assured compatibility. There is no dependency between this and the raw or partially processed image data. New and different capture devices can be developed totally independent of image application software development for the host PC. Changes or improvements in the image method execution environment or instruction set will occur much less frequently than changes in image capture devices or application software. If it does become necessary to change the image method execution environment or instruction set, the new version can be made backward compatible with the older version(s) much more easily than if every existing capture device and software application had to be tested with the new version. Backward compatibility need only be done against existing image *objects*.

The most likely objection to this scheme is the amount of storage overhead it represents. For portable digital cameras image storage is typically at a premium. The exact amount of overhead imposed by adding methods to image objects will of course depend on the complexity of processing required by the raw image format. If storage utilization is optimized by using in-camera compression via some complex algorithm such as JPEG or fractal technology, the image object methods are likely to be relatively large, which tends to mitigate the gains realized by compression. It should be remembered, however, that the image object methods can be highly optimized for this particular application. For example, the locations of input and output buffers can be implicit. Address calculations and a great deal of data movement can be performed implicitly by the execution environment. The object method need only concentrate on the algorithms specific to its particular raw image format. Another optimization is to associate a single copy of the image object method with multiple sets of raw image data. In this way a single image object might contain multiple images, becoming in effect like a roll of film. Executing the image method would then be roughly equivalent to developing the film. The following diagrams illustrate the concept.



Removable media containing multiple independent image objects.



Removable media containing a single image object with multiple images.

Another potential objection is the risk of compromising key intellectual property on the part of camera makers by having their image object methods reverse engineered. Examples of key technology might be methods of interpolating color filter array patterns, gamma correction or white balance algorithms, etc. Current practice is to incorporate these functions into the camera, which makes them nearly inaccessible, or into host software in the form of dynamically linked libraries. Fear of compromise typically is based on the assertion that interpreted code is easier to reverse engineer than native machine language. Image methods can be implemented in native machine language as well as in pseudo code, so the issue becomes one of implementation, not a flaw in the base technology. For truly critical proprietary technology, processing can still be carried out in the camera. It is important to remember that the embedded image object method can perform any amount of processing, including none at all. For camera makers who wish to strongly protect their processing technology all processing could be done in the camera, with the image object method doing nothing but copy the finished data to the output buffer.

ESSENTIAL ELEMENTS (CLAIMS)

The key elements of this invention are as follows:

1. The combination of image data with executable code specifically optimized for the types of processing necessary for images. — OLE
2. The idea of combining a single copy of the image method with multiple distinct images to minimize storage overhead while retaining the benefit of the technology.
3. The ability to protect key technology by performing related operations before generating image object method code, i. e. not including sensitive code in the image method.
4. Minimizing storage consumption and maximizing performance by abstracting as many functions as possible to execute in pre written libraries on the host machine using MMX™ technology.

VALUE TO INTEL

Digital photography is a key element in Intel strategy to promote and maintain the evolution of the PC using Intel microprocessors. Adoption and deployment of an image standard that solves the problems of interdependency between image peripheral makers and software developers will greatly accelerate the creation of new markets based on digital photography. This technology also presents a unique opportunity to add value by optimizing for use with MMX™ technology. Wide spread deployment of the technique would result in nearly all image processing being done on MMX™ enabled machines.

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From:	Farzad Amini (ext. 752)
Date:	
Time:	
Number of Pages:	6 **(Including Cover Sheet)**
Operator:	Nedy Calderon
Our Reference:	042390.P4817

SUBJECT:	Image Object patent application
REMARKS:	Please see enclosed figures. The application is being e-mailed to you.

TRANSMISSION REPORT (12:04) ;BST&Z

DATE	START TIME	REMOTE TERMINAL IDENTIFICATION	MODE	TIME	TOTAL PAGES	RESULTS
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From: Phillip E Mattison ( )
To: farzad_amini

Docket # 042390.P4817 10:09 AM

Farzad,

I reviewed the application draft and figures you sent me. The figures look good except for Figure 5. The VIP compiler would actually be used to compile image object methods during image device development, to be stored as part of the image object, and therefore is not part of the virtual machine. The "TIFF/EP compliant imaging device driver" is only a specific example, and could be any communication driver for transfering image objects between devices and hosts. I would characterize the VIP as being equivalent to what you have termed the "abstract machine 120."

Regarding the text; page 2 line 25: It may not be practical to store a Twain module because of memory limitations and because twain modules are generally written in native code for the host system. This creates a security risk as viruses may be propagated via such native object methods, plus such native code may only be executed on a particular target host processor, i.e. it is hardware specific.

Page 7 line 11-12, I don't understand this statement.

Page 8 line 5, "The image method is a program -or- list of..."

Page 12 line 21, Yes, the hardware platform. Line 23-24, Not sure how well-known JIT compilers are. Might be best to include a paragraph of explanation.

In general this application seems to cover the abstract concept pretty well in my opinion. Not sure how many specific examples should be included. My white paper included many as I hoped to possibly implement the idea and wanted to be specific enough to facilitate a funding/staffing decision. I would suggest possibly including the specific suggestions relating to variable length address usage, implicit parallelism of execution for arrays, type-aware virtual stack implementation, built-in memory allocation instructions, and variable length expression encoding. Details of binary-level encoding probably are not necessary.

Give me a call or respond by e-mail if you have any questions.

Thanks,
--Phil M.

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OF COUNSEL:
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July 17, 1998

ATTORNEY-CLIENT PRIVILEGED
CONFIDENTIAL COMMUNICATION

Phillip E. Mattison
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Re: U.S. Patent Application for:
IMPROVING THE PORTABILITY OF DIGITAL IMAGES
Our File No. 042390.P4817

Dear Phil:

Enclosed is a draft of a United States Patent Application for the above-noted invention. Please carefully review the Application and associated drawings (Figures 1-4), making any necessary corrections directly on the draft. Please address my questions and comments which appear within square brackets or are underlined throughout the application.

During your review please bear in mind that the description of the invention should be in sufficient detail such that a person skilled in the field of the invention can make and use the invention without undue experimentation. If you have any questions concerning this point, please do not hesitate to call. Another requirement necessary to obtain a valid patent is that the best mode known to the inventor for practicing the invention must be included in the description of the invention. Again, do not hesitate to call if you have any questions on this point.

Once you have completed your review, please forward the draft and associated drawings back to me at your earliest possible convenience. A revised

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application will be prepared along with the necessary formal documents to permit us to file the application with the United States Patent and Trademark Office.

If you have any questions regarding the application, please call me at your earliest convenience.

Very truly yours,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN

Farzad E. Amini

FEA/ncg
Enclosures

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Company:	INTEL CORPORATION
Fax No.:	602-554-9880
From:	Farzad Amini
Date:	July 17, 1998
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SUBJECT:

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STEPHEN D. GROSS (1953-1995)

OF COUNSEL:
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NORMAN ZAFMAN*

August 13, 1998

VIA FEDERAL EXPRESS

Phillip E. Mattison
INTEL CORPORATION
M/S CH6-410
5000 W. Chandler Blvd.
Chandler, Arizona 85226

Re: U.S. Patent Application for
IMPROVING THE PORTABILITY OF DIGITAL IMAGES
Our File No. 042390.P4817

Dear Phil:

Enclosed is a revised draft (including all of the changes to date) of a patent application for the above-noted invention. Please review the application and associated drawings (Figures 1-4). Please initial and date any necessary corrections directly on the revised draft.

As part of the requirements for obtaining a U.S. Patent, each inventor must sign a Declaration stating that he or she: (1) has reviewed and understands the contents of the application, including the claims; (2) believes he or she to be the original and first inventor of the claimed invention; and (3) acknowledges his or her duty to disclose to the Patent Office all information known to the person to be material to patentability. Accordingly, enclosed please find an original of such a Declaration document. At this time, we ask that you read the Declaration and, if all is in order, please sign and date the original Declaration document. In addition, please note that a Power of Attorney, giving our firm the authority to act on your behalf before the Patent Office, is also included in the Declaration document.

Also enclosed please find an original of an Assignment document whereby you assign the subject invention and your rights to a prospective patent

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claiming the invention to Intel Corporation. We have prepared the Assignment on the assumption that you have agreed to assign your above-described interests to Intel Corporation. If this assumption is correct, then please sign and date the Assignment document.

Also, please verify that your full legal name and your residence address are correct in the formal documents. Return the draft application (including any changes) and completed formal documents to me as soon as possible. We will then file the application, along with the signed documents, with the U.S. Patent and Trademark Office, and send a copy of the application as filed to you.

If you have any questions, please call me at (310) 207-3800, ext. 752 at your earliest convenience.

Very truly yours,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN

Farzad E. Amini

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